Momentum
170 DNT 110 00
Bus Adapter for PROFIBUS DP
User manual

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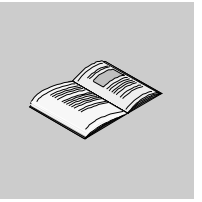

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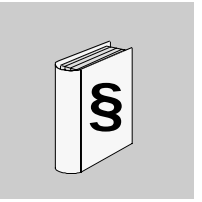

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death, serious injury, or equipment damage.

WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE

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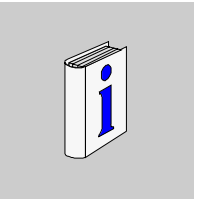
About the Book



At a Glance

Document Scope

This user manual contains information about Momentum components for use with PROFIBUS DP.

Validity Note

The data and illustrations found in this document are not binding. We reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be construed as a commitment by Schneider Electric.

Related Documents

Title of Documentation	Reference Number
Momentum I/O Units, User Manual	870 USE 002 00
Profibus DP Configurator, 332 SPU 931 01 (Version 2) (part of Software Package 332 SPU 833 02)	840 USE 454 00

Note: Up-to-date information about PROFIBUS DP is available from the PROFIBUS Website *http://www.profibus.com* as well as from the PROFIBUS user organization: PROFIBUS Nutzerorganisation e.V., Haid- und Neu-Straße 7, D-76131 Karlsruhe, Germany.

Product Related Warnings

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When controllers are used for applications with technical safety requirements, please follow the relevant instructions.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this product related warning can result in injury or equipment damage.

User Comments

We welcome your comments about this document. You can reach us by e-mail at TECHCOMM@modicon.com

PROFIBUS DP and PROFIBUS DP configuration with Momentum

I

Overview

Introduction

This Part contains General Information about PROFIBUS DP, configuration with Momentum as well as connecting the communications adapter and installing the network.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
1	PROFIBUS DP and PROFIBUS DP Configuration with Momentum	11
2	Use of I/O Base and Communications Adapter	15
3	Mounting the Components and the Connecting the Cables	21
4	EMC Measures for the Communications Adapter	31
5	Ordering Details for PROFIBUS DP Components	37

PROFIBUS DP and PROFIBUS DP Configuration with Momentum

1

Overview

Introduction

This Chapter gives an overview of the PROFIBUS DP, the 170 DNT 110 00 Communications Adapter and the configuration of PROFIBUS DP with Momentum.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Introduction to PROFIBUS DP	12
PROFIBUS DP Configuration with Momentum	13
PROFIBUS DP Configuration Limits	14

Introduction to PROFIBUS DP

Introduction

PROFIBUS DP is an open industrial standard for integrated communication. It is a serial fieldbus, which provides a decentralized connection between sensors, actuators and I/O modules produced by various manufacturers, and connects them to the superset control level. PROFIBUS DP is a version of PROFIBUS optimized for performance, and was specifically designed to meet time critical communications requirements between the controller level and peripheral process devices.

The PROFIBUS DP network supports multiple communications master devices and several slaves. A master may be a PLC (e.g a Quantum with communication module 140 CRP 811 00), a PC or another controller device. A Momentum I/O module with communications adapter 170 DNT 110 00 is a typical PROFIBUS DP slave.

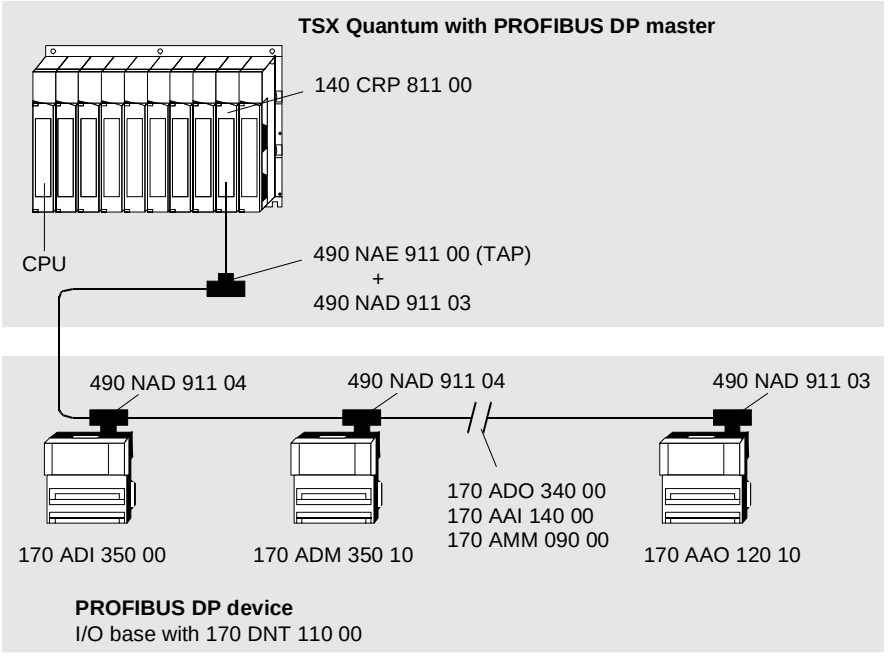
A PROFIBUS DP network supports a data rate of 12 Mbps over distances of 100m and a data rate of 93.75 kbps over distances up to 1200m. The cable consists of 2-wire shielded cable.

A PROFIBUS DP network can support up to 125 devices (recommended configuration: one master per network) with up to 32 slaves per network segment. The individual segments are connected by repeaters. A typical PROFIBUS DP configuration with Momentum modules can be found in the *Configuration, p. 13*section.

PROFIBUS DP Configuration with Momentum

Configuration

The following example shows the use of Momentum I/O modules with the PROFIBUS DP.



Note: A PROFIBUS terminating connector (e.g. 490 NAD 911 03) must always be used at the front and back ends of the bus.

Detailed information about PROFIBUS DP standards can be found on the PROFIBUS website (www.profibus.com).
Further details about topology and configurations are contained in the manuals for the relevant PROFIBUS DP masters.

PROFIBUS DP Configuration Limits

Requirements

The configuration limits assume a Quantum with a 140 CRP 811 00 as a master (see also the hardware description of the 170 DNT 110 00 communications adapter).

Configuration Limits

The following configuration limits apply to the PROFIBUS DP:

Parameter	Limitations
max. number of devices	125 with repeater (max. 32 per segment)
max. number of I/O points per slave	244 bytes each
Transfer rate	9.6 kBit / s to 12 MBit / s

Bus Length

Bus Length as a Function of the Transfer Rate

Bus Length	Transfer Rate
Max 1.200 m (100 m)	9.6 ... 19.2 ... 93.75 kBit/s
Max 1000 m	187.5 kBit/s
Max 400 m	500 kBit/s
Max 200 m	1.5 MBit/s
Max 100 m	3 ... 6 ... 12 MBit/s

Use of I/O Base and Communications Adapter

2

Overview

Introduction

This chapter describes the relationship between the I/O base and the communications adapter

What's in this Chapter?

This chapter contains the following topics:

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General Information about Communications Adapter 170 DNT 11000	16
Architecture and Functionality of the Communications Adapter for PROFIBUS DP	18
Potential Isolation of the PROFIBUS DP Bus Interface	20

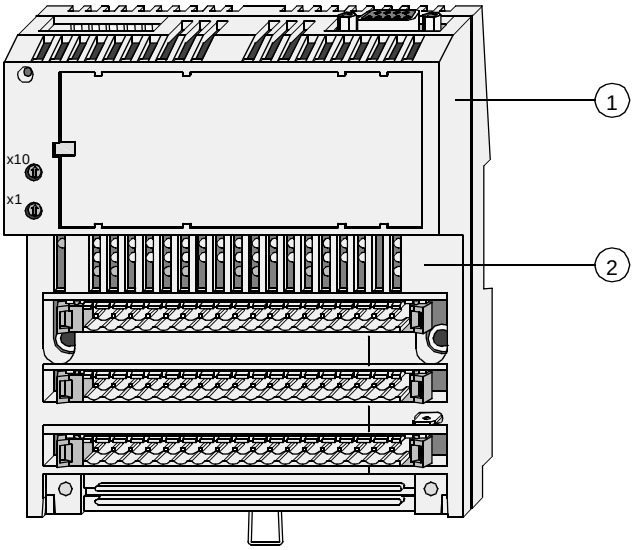
General Information about Communications Adapter 170 DNT 11000

General Information about Structure

The communications adapter can be combined with any I/O base from the Momentum family. Together they form a functional I/O module for the PROFIBUS DP network. These I/O modules can be used in a network together with other PROFIBUS DP compatible devices.

Representation of I/O Base with Adapter

View of an I/O base with PROFIBUS DP adapter installed:



1 170 DNT 110 00 Communications adapter

2 I/O base

A fill-in label is shipped with the I/O base. This label fits into an area on the front of the adapter. The signal names belonging to the sensors and actuators can be written here. On the right hand side of the label is a clear window, through which the name of the communications adapter can be seen.

Identification of decentralized I/O modules

Every Momentum I/O module in the PROFIBUS DP network needs an individual address, which can be assigned using the address switches on the front of the 170 DNT 110 00 communications adapter. Address settings are described in the section *Address Settings, p. 45*. This enables the PLC to communicate with each module individually via the PROFIBUS DP master.

The PROFIBUS DP adapter has a PNO ident number (7512 hex). This ident number is used for the internal administration of the PROFIBUS.
The I/O unit also has an ident number, which is evaluated by the communications adapter and output (via the bus) to the master for identification purposes. This acts as a safeguard against configuration error. The evaluation of the I/O base ident number is described in the Section *Ident Codes for Momentum I/O Bases, p. 68*.

Compatibility with TIO Modules

If a TIO (Terminal Block I/O) is replaced with a suitable Momentum module, a reconfiguration of the bus is necessary, (because Momentum module ident numbers differ from those of the TIOs). However, the user files remain the same.

Similarly, I/O errors will be represented differently from standard TIOs. If TIOs are replaced by Momentum modules, the byte must be queried for > 0, in order to remain compatible with standard TIOs (see *I/O Error (Diagnostic Byte 8), p. 66*).

Environmental Specifications

The communications adapter and the I/O units that can be mounted on it conform to the same environmental specifications. This information about I/O bases can be found in the system data in the user manual *I/O Units for Momentum*.

Architecture and Functionality of the Communications Adapter for PROFIBUS DP

Hardware Function Blocks

The communications adapter consists of 4 hardware function blocks:

- *RS 485 PROFIBUS DP Interface, p. 18*
- *ATI I/O Base Interface, p. 18*
- *Protocol Execution, p. 18* (EPROM with firmware)
- *Voltage Supply, p. 18*

RS 485 PROFIBUS DP Interface

The communications adapter has a standard fieldbus interface for the PROFIBUS DP. The interface contains the PROFIBUS protocol chip and complies with the PROFIBUS DP standards per EN 50170 (DIN 19245 Parts 1 and 3 are integrated). The signals are executed as differential signals.

ATI I/O Base Interface

The ATI interface is an internal interface. It allows data exchange between the communications adapter and the I/O base.

Protocol Execution

The firmware for protocol execution is stored in an EPROM. The communications adapter's firmware executes the protocols between the I/O module and the master. The transfer mode is half-duplex.

Integral functions are:

- After voltage is applied or reset is activated, the communications adapter receives information about the data size requirement of the I/O base. The communications adapter also receives the I/O base group and code information. This information is provided by the I/O base.
- The PROFIBUS DP master sends each slave (I/O module) the configuration data specified in the GSD file. Typical configuration data is e.g.: Identification of the I/O base, I/O data size etc. The I/O module compares the configuration data with its own actual data. If the data match, the master parameterizes the I/O module, and communication can be established.
- If the I/O base detects an I/O error, the error signal is sent to the master as part of a (non-cyclic) diagnostic message (see evaluation of the, *I/O Error (Diagnostic Byte 8), p. 66* diagnostic message).

Voltage Supply

The internal voltage supply (Vcc) is provided by the I/O base. Vcc is monitored and a reset signal is generated if and when Vcc is not within tolerance. The isolated voltage (Vcx) for the PROFIBUS DP interface is generated via a DC/DC converter and is not monitored.

Message Types and Data Transfer

The 170 DNT 110 00 PROFIBUS DP communications adapter recognizes three types of messages:

- USER DATA (input and output data and parameters)
- Diagnostic data
- Bus configuration

These messages are transferred in different cycles between the master and the I/O module (slave). The 170 DNT 110 00 communications adapter handles this task for the I/O module:

Transfer Cycle	Description
Cyclical transfer of the USER DATA	A transfer sequence in which input data is read from the DP slave by the master, and then output data is written to the DP slave. The parameters for analog modules are included in the I/O data.
Non-cyclic transfer of status information for diagnostics	If new diagnosis data is detected, a flag is set by the slave. This causes the master to poll the data.
One-time transfer of PROFIBUS DP internal parameters	Bus parameters, e.g. the ident number of the DP master that configures the slaves.

Error Control

A serial microprocessor controls all of the operations within the 170 DNT 110 00 These include:

- Sending a module error to the master via the PROFIBUS DP whenever an I/O base detects an I/O error.
- The microprocessor controls a LED, which provides information about the data transfer (BF = Bus Fault), to provide a visual display of a network fault.
- Setting the Data Control Time (DCT) for the DP master, which must take into consideration all the slave watchdog settings (e.g. if slave timeout is set for 250 ms, the DCT may be set to 1500 ms, a ratio of 6 to 1)

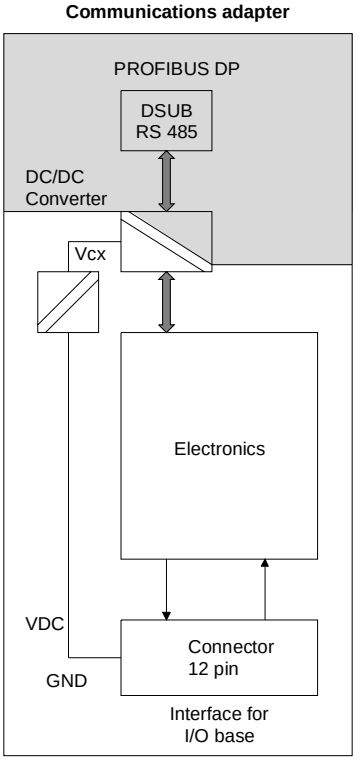
Note: The Data Control Time (DCT) and the watchdog times are entered with the corresponding bus projection tool during bus projection.
The master checks whether it had application data transmission with all slaves. The watchdog time is set for each slave. If the slave hadn't been polled by the master during this time, it sets its outputs to the defined shutdown value.

Additional information can be found in the software documentation for your PROFIBUS DP master.

Potential Isolation of the PROFIBUS DP Bus Interface

Potential Isolation

The bus interface is always isolated, as shown in the illustration.



Mounting the Components and the Connecting the Cables

3

Overview

Introduction

This Chapter describes the mounting of the I/O base and the communications adapter and the connection of the connection cable.

What's in this Chapter?

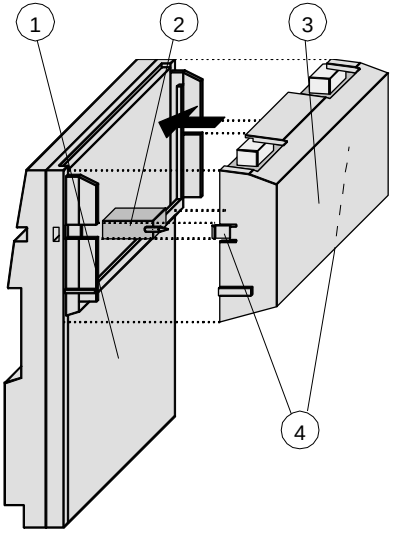
This chapter contains the following topics:

Topic	Page
Mounting of the bus adapter	22
Mounting the I/O Module	24
Connection to the PROFIBUS DP	26
Constructing the Bus Cable for the PROFIBUS DP	27

Mounting of the bus adapter

Mounting of the bus adapter

The bus adapter is connected to the I/O unit with a plug. The spring clips serve as a lock and insure a mechanically secure fit.
Diagram of the mounting of the bus adapter onto the I/O unit:



1 I/O unit

2 Connecting plug (ATI interface)

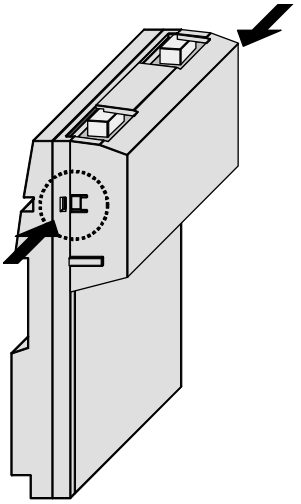
3 Bus adapter (with 1 or 2 bus plugs depending on the bus type)

4 Spring clips

	CAUTION
	The I/O module corresponds to protection type IP20. i.e. these modules must be mounted in enclosed switch cabinets in electrical equipment rooms. When working at switch cabinets, the user must electrically discharge themselves to protect the modules from electrostatic charges. **Failure to follow this precaution can result in injury or equipment damage.**

Disconnection of the bus adapter

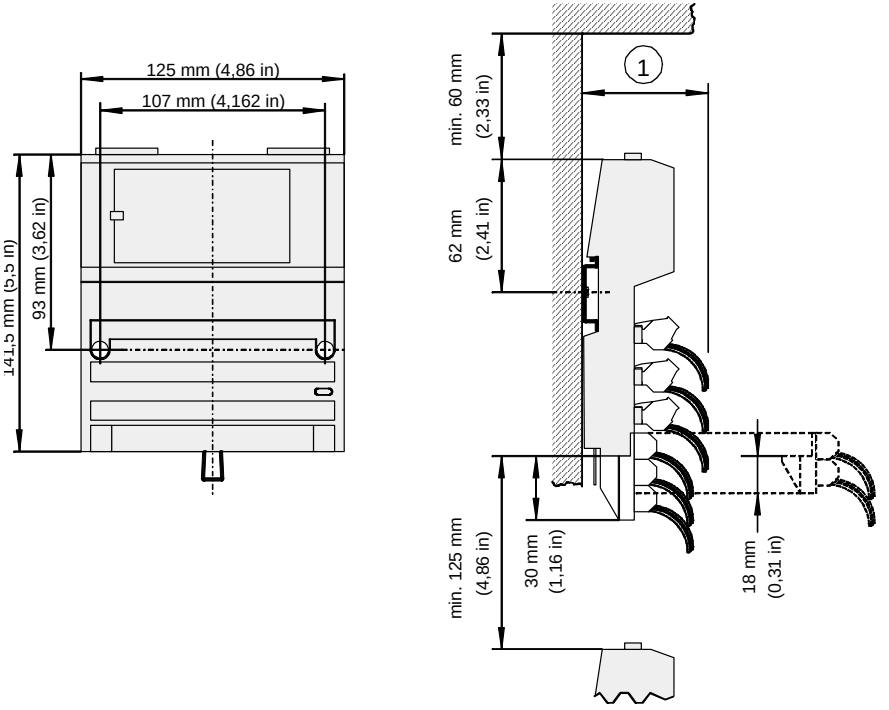
The adapter can be disconnected using a screwdriver (see arrow).



Mounting the I/O Module

Dimensions of the I/O Module

The following illustration shows the dimensions of the I/O module with communications adapter:



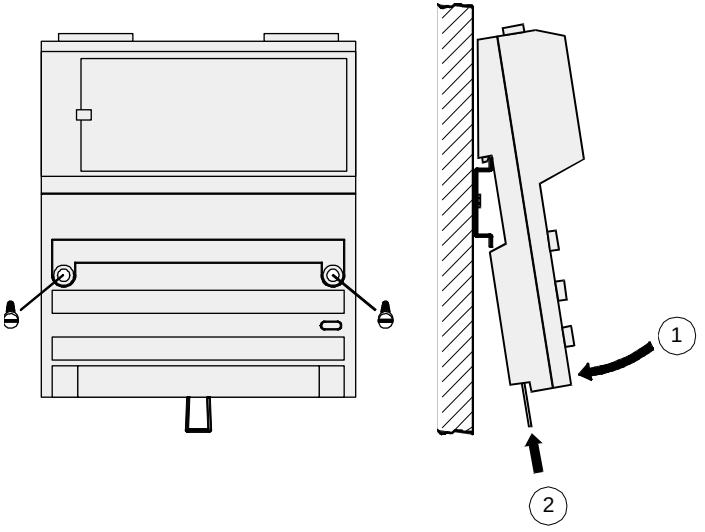
1

Type of module	Depth
Direct Current	60 mm (2.72 inch)
Alternating Current	65 mm (2.53 inch)

mounting the I/O Module

The I/O module can be mounted on a DIN bearing rail or on a wall or to a machine casing using just 2 screws.
A spring on the back of the casing produces a ground connection with the bearing rail.
Top hat rail mounting requires an additional ground connection to be made from the module's PE screw to the top hat rail.
Representation of wall and top hat installation:

Wall mounting **Top hat rail mounting**



Note: Please pay close attention to the comprehensive notes about installing and grounding the module in the user manual for Momentum product family I/O units, and for information about ordering this, see the *Related Documents* section.

Connection to the PROFIBUS DP

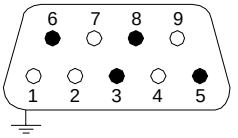
Connector

The following connectors can be used for the connection to the PROFIBUS DP.

Description	Part No.
PROFIBUS connector with termination (yellow)	490 NAD 911 03
PROFIBUS connector node (gray)	490 NAD 911 04
PROFIBUS connector node with diagnostics interface (gray)	490 NAD 911 05

Communications Adapter Interface Assignment

Communications adapter pin assignment (sockets)



● occupied
○ unoccupied

Interface assignment

Terminal	Signal	Meaning
3	RxD/TXD-P	Incoming data (RxD) positive, Outgoing data (TxD) positive
5	DGND	Reference potential for terminations (supplied by the I/O module)
6	VP	Supply voltage for terminations (+5 V supplied by the I/O module)
8	RxD/TXD-N	Incoming data (RxD-N) negated, Outgoing data (TxD-N) negated
1, 2, 4, 7, 9		Pin not connected
Connector housing		Cable shield connection (internally connected)

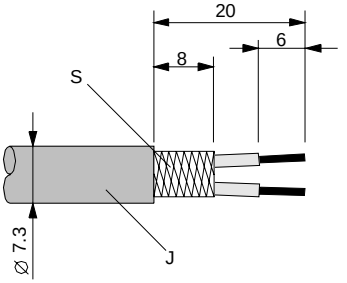
Constructing the Bus Cable for the PROFIBUS DP

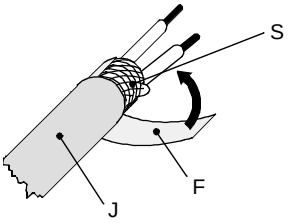
Overview

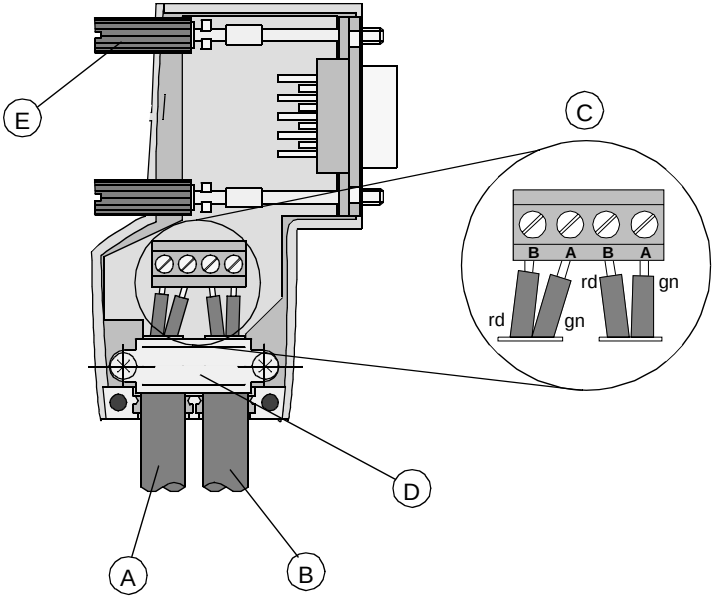
The bus cable for connecting PROFIBUS DP devices must be constructed by the user.
A special PROFIBUS cable (2 conductor, shielded) is required, this is available as an individual item from Schneider among others, see *Ordering Details for PROFIBUS DP Components, p. 38*. Furthermore, three different *Connector, p. 26* are available.

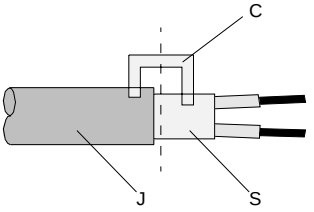
Constructing the Bus Cable

To construct the cable, proceed as follows:

Step	Action
1	Cut the cable to the required length.
2	Prepare the cable ends as shown in the illustration (dimensions in mm):  **J** PVC jacket **S** Braided shielding
3	Remove the PVC jacket **J** to the length shown.

Step	Action
4	Wrap the supplied copper foil shielding **F** round the shielded braiding **S**:  **J** PVC jacket **S** Braided shielding **F** Copper foil shielding Additional foil can be obtained from 3 M, see *Ordering Details for PROFIBUS DP Components, p. 38*.

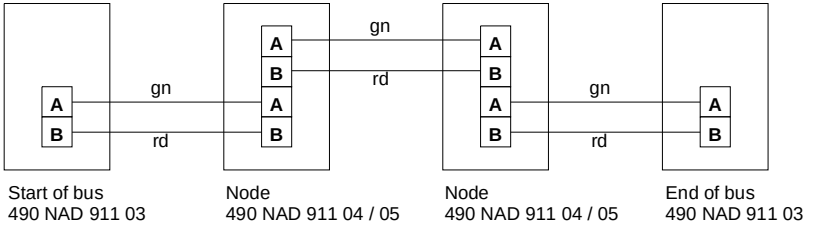
Step	Action
5	Plug the leads of the corresponding cable(s) into the terminals as shown: ● **Green** lead in terminal **A** ● **Red** lead in terminal **B** **Note:** Do **not** screw the corresponding screws in yet. Connection terminal assignment on the PROFIBUS DP (example: 490 NAD 911 04 PROFIBUS connector):  **A** Incoming cable KAB PROFIB **B** Outgoing cable KAB PROFIB (not available with 490 NAD 911 03) **C** Connection terminals (only once (B,A) with 490 NAD 911 03) **D** Cable cleat for relieving weight **E** Bus connector screws

Step	Action
6	Attach the cables with the available cable cleat to create a robust shielded connection and relieve weight as shown:  **J** PVC jacket **S** Braided shielding with foil shielding **C** Cable cleat **Note:** Half of the cable jacket must lie under the cable cleat. Pay attention to the installation direction of the cable cleat.
7	The shielding of the two cables are each internally connected with the metal housing of the connector.
8	Close the connector housing.
9	Perform the central discharge function for the shielding in accordance with *Central Discharge Function for the PROFIBUS DP, p. 32*, before connecting the bus cable to the modules.
10	Plug the PROFIBUS DP connector into the corresponding module and secure it with the screws.

Start of Bus and End of Bus

The PROFIBUS connector with termination (490 NAD 911 03) is required for the start and end of the bus. These connectors emulate the line impedance.
It is recommended that at least one connector with diagnostics interface (490 NAD 911 05) is used.

Wiring diagram for a PROFIBUS DP cable



EMC Measures for the Communications Adapter

4

Overview

Introduction

This Chapter contains notes about the central discharge function of the PROFIBUS DP and surge protection for bus leads.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Central Discharge Function for the PROFIBUS DP	32
Surge Protection for Bus Leads (Lightening Protection)	33

Central Discharge Function for the PROFIBUS DP

Central Discharge Function

Each cable shield should be galvanically grounded with the earth using FE/PE grounding clamps immediately after the cable has been connected to the cabinet.

Static Discharge

In the case of a very long bus cable, which has been installed but not yet connected, you must discharge the static as follows:

Step	Action
1	Select **the** PROFIBUS DP connector **closest to the FE/PE grounding clamp**.
2	Touch the **metal of the connector housing** to the cabinet's FE/PE grounding clamp to carry out a static discharge.
3	Now connect the bus connector to the device.
4	Discharge the other PROFIBUS DP cable connectors as described in steps 2 and 3.

Note

Note: During mounting, the metal part of the PROFIBUS DP connector is connected internally to the cable shield. When the bus cable connector is inserted into the module's PROFIBUS port, a short connection between the shield and the FE/PE is created automatically.

Surge Protection for Bus Leads (Lightening Protection)

Surge Protection for Bus Leads up to 12 Mbps Signals

To protect transmission systems from extraneous surges (lightning), the PROFIBUS DP lead should be equipped with suitable surge protection equipment once it extends outside a building.
The nominal discharge current should be at least 5 kA.
Examples of compatible lightning arrestors include **Type CT MD/HF5** and **Type CT B110** made by the firm Dehn und Söhne GmbH & Co KG. For supplier addresses and order numbers, see *Ordering Details for PROFIBUS DP Components, p. 38*.
For adequate protection of a PROFIBUS DP cable, two sets of protection equipment are required for each building. The first set of protection devices (type B110), located where the cable enters the building, works as a lightning conductor, the second (type MD/HF5), located near the first device, works as a surge protection device.

Connection Rules for Protection Equipment

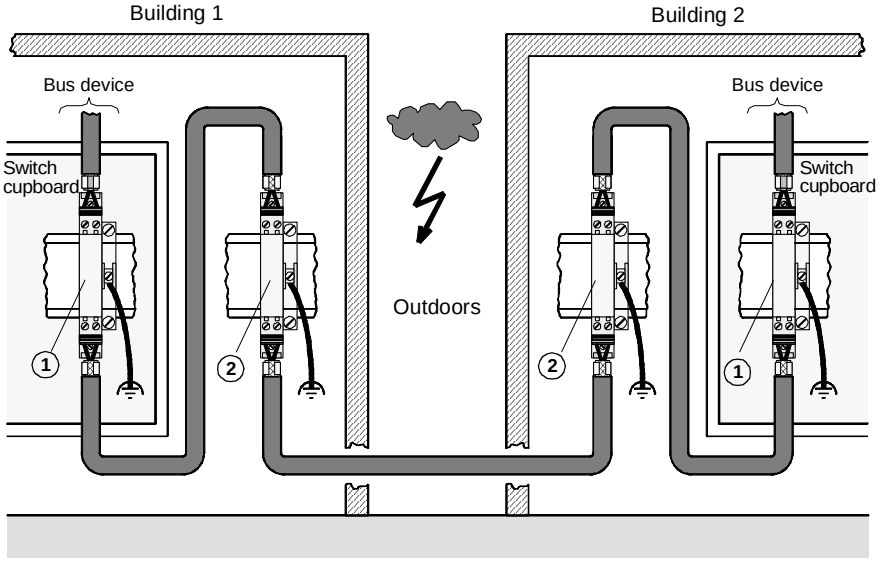
Before connecting the protection equipment, please pay close attention to the following rules:

- Install a functional ground (potential-equalization rod)
- Install the protection equipment near the functional ground, to keep surge current path as short as possible.

  Keep the lead to the functional earth as short as possible. (minimum 6mm^2)
- The maximum lead length depends on the transfer rate.
  - **Up to 500 kbps** you may configure a maximum of **4 outdoor sections** with 8 pairs of protection devices (CT B110 and CT MD/HF5).
  - **From 1MBaud** up to the highest transfer rate you may only configure **1 outdoor section** with 2 pairs of protection devices.
- Do **not** mix up the IN and OUT sides of the lightning conductors (IN = outdoor side)
- Carry out a shield grounding (See *Shield Grounding of Surge Protection Devices, p. 35*) of the PROFIBUS DP lead according to the type of lightning conductor (type CT B110 or CT MD/HF5) being used.

Connection Plan for Protection Devices

Connection plan of the protection devices:



Type and number of lightning conductors made by the firm Dehn und Söhne GmbH &Co KG suitable for a PROFIBUS DP cable

No.	Type	Number per Group
1	CT MD/HF 5	2
2	CT B110	2

Note: Information about mounting and connecting the leads can be found in the relevant installation instructions, which are enclosed with the lightning conductors.

Shield Grounding of Surge Protection Devices

The protection devices permit direct or indirect shield grounding. The gas-type surge protector acts as an indirect ground.
In both cases EMC spring terminals grasp the input and output sides of the cable shield.

Note: When the system permits it, we recommend you use direct shield grounding.

Types of shield grounding assignment

Type of grounding	Assignment
Direct shield grounding	Connect the shield of the incoming cable to the IN terminal, and that of the outgoing cable to the OUT terminal. The shields are now galvanically connected to the PE.
Indirect shield grounding via gas-type surge protector	Connect shields as described for direct shield grounding. Insert the gas-type surge protector in the rack beneath the cabinet connection terminals on the input side.

Note: Information about grounding and shield grounding can be found in the relevant installation instructions which are enclosed with the lightning conductors.

Ordering Details for PROFIBUS DP Components

5

Introduction

Overview

This Chapter contains ordering details for PROFIBUS DP components as well as the necessary accessories.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Ordering Details	38
Ordering Details for PROFIBUS DP Components	38

Ordering Details

Overview

You can order the following PROFIBUS DP products for the Momentum family:

- Communications Adapters
- File with the Device Data Base
- Cables and Connectors
- Surge Protection Equipment

Ordering Details for PROFIBUS DP Components

Communications Adapter and Device Data Base

The following communications adapters and diskettes containing the device data base are available:

Description	Part No.
Communications Adapter for PROFIBUS DP	170 DNT 110 00
Device data base file	381 SWA 000 00 *)
Label	Corresponding to the I/O base in use
*) diskette is part of this manual	

Cables and Connectors

The following cables and connectors are available for the construction of PROFIBUS DP cables:

Description	Part No.
PROFIBUS cable (by the meter)	KAB PROFIB
PROFIBUS connector termination	490 NAD 911 03
PROFIBUS connector node	490 NAD 911 04
PROFIBUS connector node with interface for programming unit	490 NAD 911 05
Foil shielding	3M, part no. 1183

Note: Foil shielding supplier:
3M Deutschland GmbH, Carl-Schurz-Straße 1, D-41 453 Neuss, Germany

Surge Protection Equipment

The following protection equipment and accessories can be connected to the PROFIBUS DP, and are available from the firm Dehn und Söhne GmbH &Co KG.

Description	Part No.
Lightning conductor type CT MD/HF 5	Dehn, part no. 919 570
Lightning conductor type CT B 110	Dehn, part no. 919.510
Base component for lightning conductor type CT	Dehn, part no. 919.506
Gas-type surge protector for lightning conductor type CT	Dehn, part no. 919.502
EMC spring terminals	Dehn, part no. 919.508

Note: Supplier for the lightning conductors and accessories:
Dehn und Söhne GmbH & Co KG, Postfach 1640, D-92306 Neumarkt/Opf, Germany.

Module Descriptions for PROFIBUS DP Modules

II

Overview

Introduction

This part contains descriptions of the PROFIBUS DP modules for Modicon Momentum listed in alphabetical order.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
6	Module Descriptions for the 170 DNT 110 00 Communications Adapter	43

Module Descriptions for the 170 DNT 110 00 Communications Adapter

6

Introduction

Overview

This Chapter describes the 170 DNT 110 00 communications adapter for PROFIBUS DP.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Brief Description	44
Description of the Display and Operational Control Components	45
Technical Specifications	48

Brief Description

General Information

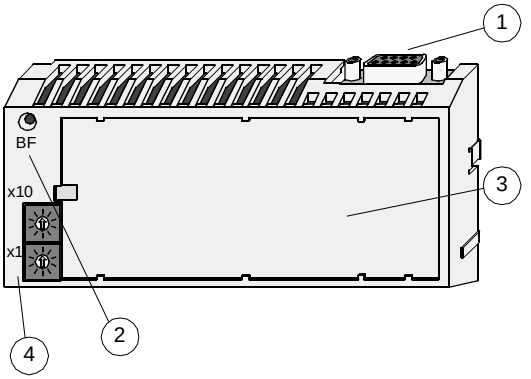
The 170 DNT 110 communications adapter is the interface between the Momentum I/O bases and the PROFIBUS DP network. It can be connected to any Momentum I/O base.

Physical Structure of the Adapter

The adapter has 1 interface for connection to the PROFIBUS DP and 2 address switches for setting the PROFIBUS DP address.
The operating mode is displayed by 1 LED.

Position of the Adapter Components

Position of the adapter components



1 PROFIBUS DP connector (sockets)

2 LED display

3 Area for label (near to the I/O base)

4 PROFIBUS DP address switch

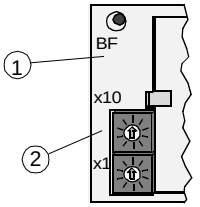
Software Linkages

A device data base file is needed to integrate the I/O base into the user program. The diskette is part of this manual. A README file with further information is contained on the diskette.

Description of the Display and Operational Control Components

Layout of the Components

Layout of the Display and Operational Control Components



1 LED

2 Address switch for the PROFIBUS DP address

Status of the LED Display

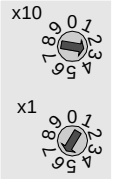
Status of the LED display:

LED	Status	Meaning
BF	Red	Bus error: The internal watchdog has responded or a reset has occurred.
	Off	The module is working in a data exchange cycle.

Address Settings

The user must assign a PROFIBUS DP address to each device. For Momentum family slaves, this address is between 1 and 99. The address allocation is dependent on the physical arrangement of the modules on the PROFIBUS DP. The address is set on the front side of the communications adapter, and must be identical to the one allocated during bus configuration. This ensures that all outgoing and incoming messages within the network reach the device for which they are intended.

Setting the PROFIBUS DP address to 36



Possible PROFIBUS DP addresses

PROFIBUS DP Address	Upper Address Switch (x 10)	Lower Address Switch (x 1)
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 69	6	0 ... 9
70 ... 79	7	0 ... 9
80 ... 89	8	0 ... 9
90 ... 99	9	0 ... 9

CAUTION

Addressing on the PROFIBUS DP

Do not begin operating any module before the slave address has been set. See your network administrator to find out the correct device addresses.

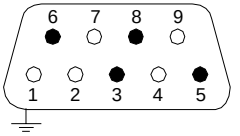
Should you need to modify the addresses while the module is in operation, the power supply must be switched off and then on again. This is because addresses are only uploaded at the point when voltage is applied.

No duplicate addresses may be used with the PROFIBUS, because this can lead to conflicts on the bus.

Failure to follow this precaution can result in injury or equipment damage.

Interface Assignment

Communications adapter pin assignment (sockets)



● occupied
○ unoccupied

Interface assignment

Terminal	Signal	Meaning
3	RxD/TXD-P	Incoming data (RxD) positive, Outgoing data (TxD) positive
5	DGND	Reference potential for terminations, only applies to connectors with termination (supplied by the I/O module)
6	VP	Supply voltage for terminations, only applies to connectors with termination (+5 V supplied by the I/O module)
8	RxD/TXD-N	Incoming data (RxD-N) negated, Outgoing data (TxD-N) negated
1, 2, 4, 7, 9		Pin not connected
Connector housing		Cable shield connection (internally connected)

Technical Specifications

General Data

General technical specifications:

Power supply	5 VDC / 250 mA (from the I/O base)
Power consumption	250 mA at 5 V (supplied by the I/O base)
Power dissipation	1.2 W (type)

Potential Isolation

Potential isolation bus interface:

RS85	Isolated from remaining logic

Error Detection

Error detection

Data exchange	Red LED for bus error (BF) and I/O Error message at the master for digital inputs and outputs, Parameter Control (prm_control) message at the master for complex I/Os

Fuses

Fuses:

Supply voltage Vcc	Internal (for communications adapter) - none

PROFIBUS DP Data Interface

Interface assignment:

RS 485	See *Connection to the PROFIBUS DP, p. 26*

Bus Data

Bus length, transfer rate and protocol:

Transfer mode	Half-duplex	
Protocol transfer	PROFIBUS DP as per DIN 19245 parts 1 and 3	
Transfer rate as a function of the bus length	**Bus Length**	**Transfer Rate**
	Max 1200 m	9.6 ... 19.2 ... 93.75 kBit/s
	Max 1000 m	187.5 kBit/s
	Max 400 m	500 kBit/s
	Max 200 m	1.5 MBit/s
	Max 100 m	3 ... 6 ... 12 MBit/s

PROFIBUS DP Module Software Linkage

III

Overview

Introduction

This Part contains information about the format, size and mapping of the I/O data when using the communications adapter for PROFIBUS DP. Additionally, it also contains notes about diagnostics and trouble shooting.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
7	Communications Adapter Data Mapping for PROFIBUS DP	51
8	Diagnostics	61

Communications Adapter Data Mapping for PROFIBUS DP

7

Overview

Introduction

This Chapter contains information about the format, size and mapping of the I/O data when using the communications adapter for PROFIBUS DP.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
I/O Data Format and Size	52
Data Mapping with I/O Bases	54
Example of a PROFIBUS DP Configuration	56
Example of State Memory Addressing in Concept and Modsoft	58

I/O Data Format and Size

Overview

The I/O data contains discrete I/O points for these modules, as well as analog values and parameters for the complex (analog) I/O bases.

Each I/O unit is identified immediately after voltage is applied. Data exchange can then begin.
I/O modules with discrete, analog or mixed I/O bases are each sent messages using different data formats:

Type of I/O Base	Data Format
Discrete	Byte
Analog	Word
Discrete and analog combination / special modules	Word

Number of Words for analog I/O Bases

Number of I/O words for analog I/O bases:

Description	Function	Input Words	Output Words
170 AAI 030 00	8 input channels	8	2
170 AAI 140 00	16 input channels	16	4 (for parameters)
170 AAI 520 40	4 input channels, RTD, thermoelements	4	4 (for parameters)
170 AAO 120 00	4 output channels	0	5 (of which 1 word for parameters)
170 AAO 921 00	4 output channels	0	5 (of which 1 word for parameters)
170 AMM 090 00	4 inputs, 2 outputs (discrete)	1 (8 bits for diagnostics)	1
	4 input channels, 2 output channels (analog)	4	4 (of which 2 words for parameters)
170 ANR 120 90	8 inputs, 8 outputs (discrete) 6 input channels, 4 output channels (analog)	12	12

Number of Words for Special Modules

Number of I/O words for special modules:

Description	Function	Input Words	Output Words
170 ADM 540 80	6 inputs, 3 outputs (120 VAC) 1 Modbus interface	16	16
170 AEC 920 00	Counter	8	8

Number of Bytes for discrete I/O Bases, 24 VDC

Number of Bytes for discrete I/O Bases, 24 VDC)

Description	Function	Input Byte	Output Byte
170 ADI 340 00	16 inputs	2	0
170 ADI 350 00	32 inputs	4	0
170 ADO 340 00	16 outputs	0	2
170 ADO 350 00	32 outputs	0	4
170 ADM 350 10	16 inputs, 16 outputs	2	2
170 ADM 350 11	16 inputs, 16 outputs	2	2
170 ADM 370 10	16 inputs, 8 outputs	2	2
170 ADM 390 10	16 inputs, 12 outputs	6 (2 discrete and 4 diagnostics)	2
170 ADM 390 30	10 inputs, 8 outputs	2	2

Number of Bytes for discrete I/O Bases, 120/230 VAC

Number of bytes for discrete I/O Bases, 120/230 VAC)

Description	Function	Input Byte	Output Byte
170 ADI 540 50	16 inputs / 240 VAC	2	0
170 ADI 740 50	16 inputs / 120 VAC	2	0
170 ADO 530 50	8 outputs / 120 VAC	0	2
170 ADO 540 50	16 outputs / 120 VAC	0	2
170 ADO 730 50	8 outputs / 230 VAC	0	2
170 ADO 740 50	16 outputs / 230 VAC	0	2
170 ADM 690 50	10 inputs, 8 outputs 120 VAC	2	2
170 ADM 690 51	10 inputs, 8 outputs 120 VAC	2	2
170 ARM 370 30	10 inputs (24 V), 8 relay outputs 120 VAC	2	2

Data Mapping with I/O Bases

Discrete I/O Bases

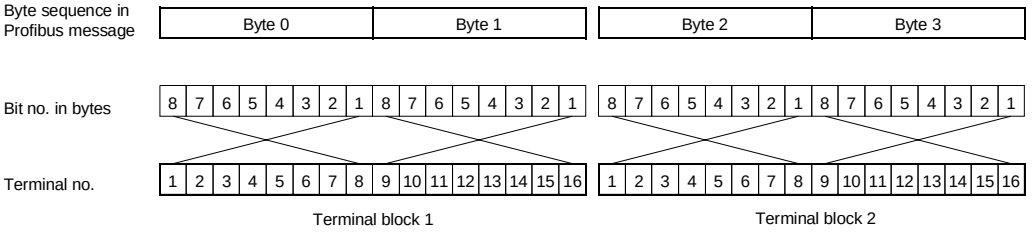
With discrete Momentum modules, each terminal I/O point is mapped according to the following principle:

- Each is mapped to bytes (max 4 bytes for 32 inputs or 32 outputs).
- The least significant byte (LSB) is sent or received first.
- The bytes (output words) sent from the communications adapter to the I/O base represent the output values.
  The bytes (input words) sent from the I/O unit to the communications adapter represent the input values and status statement.
- The register addressing is compatible with standard TIOs.

The following message structure illustrates the data exchange between the master and the slaves (I/O modules) for 2 discrete I/O bases.

Byte No.	Significance	170 ADI 350 00 input data	170 ADI 350 00 output data
0	LSB	Inputs 8...1	Outputs 8 ... 1
1	-	Inputs 16 ... 9	Outputs 16 ... 9
2	-	Inputs 24 ... 17	Outputs 24 ... 17
3	MSB	Inputs 32 ... 25	Outputs 32 ... 25

The I/O bits are mapped via the bus as follows:


Byte sequence in Profibus message
Byte 0
Byte 1
Byte 2
Byte 3
Bit no. in bytes
8 7 6 5 4 3 2 1 8 7 6 5 4 3 2 1
8 7 6 5 4 3 2 1 8 7 6 5 4 3 2 1
Terminal no.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Terminal block 1
Terminal block 2

Analog I/O Bases

With analog Momentum modules, each terminal I/O value is mapped according to the following principle:

- Each analog value is mapped onto one word.
- The least significant word (LSW) is sent or received first.
- The words (output registers) sent to the I/O base represent the output values and the parameters; the words (input registers) sent from the I/O base to the communications adapter represent the field values and status statement.
- Analog value representation occurs in compliance with IDS 3000. Sign and value are flush left (nominal range is +/- 32,000) The resolution depends on the selected measuring or output range. Negative values are represented as double complements.

The following message structure illustrates the data exchange between the master and the slave (I/O module) for the 170 AMM 090 00 module

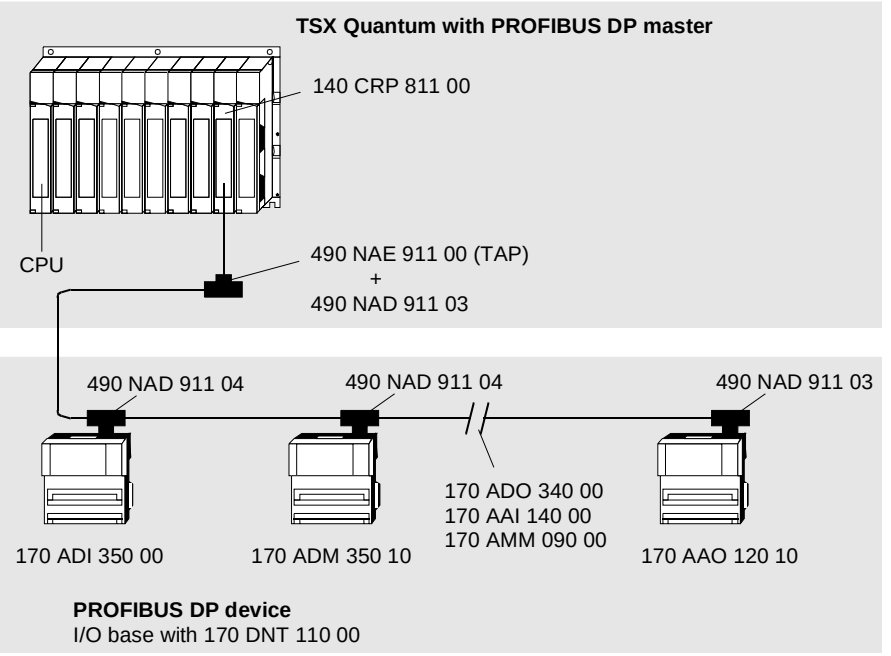
Word No.	Significance	Input data	Output data
0	LSW	Value, input channel 1	Parameter input channels 1 ... 4
1	-	Value, input channel 2	Parameter output channels 1,2
2	-	Value, input channel 3	Value, output channel 1
3	-	Value, input channel 4	Value, output channel 2
3	MSW	Discrete inputs	Discrete outputs

Further information is contained in the *Momentum I/O Bases* user manual.

Example of a PROFIBUS DP Configuration

Example of a PROFIBUS DP Configuration

The following illustration shows an example configuration for the PROFIBUS DP. Only Momentum I/O modules are used:



Note: A PROFIBUS terminating connector (e.g. 490 NAD 911 03) must always be used at the front and back ends of the bus.

The following tasks must be executed to prepare a PROFIBUS DP network for operation:

- Configure the bus by
  - *Constructing the Bus Cable for the PROFIBUS DP, p. 27* according to the configuration.
  - *Address Settings, p. 45* of the devices
- Configure the bus with an appropriate tool, which is independent of the installed system (e.g. SyCon in the case of Modicon Quantum with Concept and Premium with PL7), as well as *Installation of the Device Data Base File (GSD), p. 57*
- Allocate the I/O points for state RAM addressing using the relevant software program (e.g. Concept, PL7)

Note: Analog Momentum I/O bases only attain data exchange status when a complete set of valid parameters together with the user data are transferred to them.

Installation of the Device Data Base File (GSD)

In PROFIBUS DP, the performance features of the devices are documented by the manufacturer and provided for the user in the form of an equipment data sheet and a device data base file (GSD) and are made available to the user. The contents and codification of the device data bases correspond to accepted standards, and are therefore independent of the master. They enable the configuration of any desired number of DP slaves using various manufacturers' configuration equipment.
The device data base file is delivered in the form of a diskette (file ASA_7512.GSD for Momentum modules) and is part of this user manual (see also *Ordering Details for PROFIBUS DP Components, p. 38*). A README file with further information is contained on this diskette. How to import this GSD file is described in Parameterizing the Master.

Example of State Memory Addressing in Concept and Modsoft

Overview

PROFIBUS DP slaves require the following different memory areas:
- for USER DATA
- for diagnostic data

Example of User Data

The required bytes and words are provided by the selection of the I/O modules (see *I/O Data Format and Size, p. 52*).
The following memory assignment was selected for the *Example of a PROFIBUS DP Configuration, p. 56*:

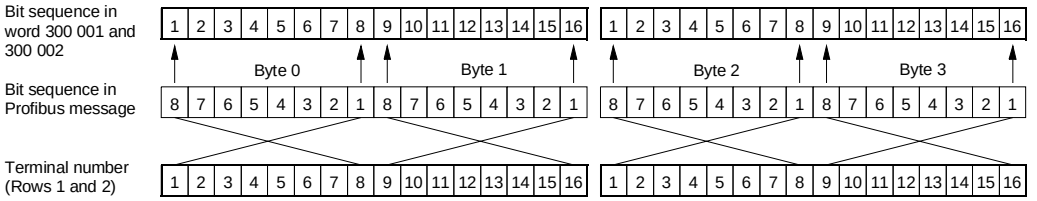
Slave Address	Momentum Module	Input Length	Output Length	Input Type	Address Inputs	Address Outputs
3	170 ADI 350 00	4 bytes	0 bytes	BOOL	300 001 - 300 002	-
4	170 ADM 350 10	2 bytes	2 bytes	BOOL	300 003	400 001
5	170 ADO 340 00	0 bytes	2 bytes	BOOL	-	400 002
6	170 AAI 140 00	16 words	4 words	UINT16	300 004 - 300 019	400 003 - 400 006
7	170 AMM 090 00	5 words	5 words	UINT16	300 020 - 300 024	400 007 - 400 011
8	170 AAO 120 00	0 words	5 words	UINT16	-	400 012 - 400 016

In the example, memory was allocated when the master was parameterized. The word format (because the I/O base is analog) was also selected when the master was parameterized.
In this example, data transfer via the bus for discrete I/Os occurs in bytes and in accordance with the following rules:
- The user data is shifted flush left in the word
- Byte 0 is the first byte to be sent, followed by bytes 1, 2 and 3 with 32 inputs or outputs

Note: For discrete I/O bases, 0x and 1x references can also be selected.

In the example, the bus master converts bytes into words, before they are stored in the PLC memory. For the slave 3 (170 ADI 350 00), the input bits are stored in the words 300 001 and 300 002.

Within the words, the I/O base's inputs are as follows:



This leads to the following data mapping (input type BOOL):

Byte No.	**Byte 0**								**Byte 1**							
Bits in word 300.001	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9
Terminal No.: Row 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Byte No.	**Byte 2**								**Byte 3**							
Bits in word 300 002	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9
Terminal No.: Row 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Example of Diagnostic Data

A diagnostic message includes 19 bytes per I/O module. The bytes are mapped onto words.
The meaning of the bytes is described in the *Structure of the Diagnostic Message, p. 63* section. Bytes 1 and 8 are required for error evaluation. For complex modules (analog), byte 9 is also required (it displays, among other things, whether a parameter default is valid or invalid).
In the example therefore, only the first 8 or 9 bytes of each module are saved in the controller.
The following memory is reserved:

- Eight words are required for the discrete modules' diagnostic data (bytes 1 … 8)
- Nine words are required for the analog modules' diagnostic data (bytes 1 … 9).

If the ident code (bytes 18 and 19) is to be likewise evaluated, 19 words must be reserved for 19 bytes. These options must be considered during the parameterization of the master.
The memory partitions for the example can be constructed as follows:

Slave Address	Momentum Module	Input Length	Input Diagnostic Address
3	170 ADI 350 00	8 words	300 301 - 300 308
4	170 ADM 350 10	8 words	300 309 - 300 316
5	170 ADO 340 00	8 words	300 317 - 300 324
6	170 AAI 140 00	9 words	300 325 - 300 333
7	170 AMM 090 00	9 words	300 334 - 300 342
8	170 AAO 120 00	9 words	300 343 - 300 351

For example, the following table displays the data mapping for the slave's diagnostic byte 1 with address 7 (170 ADI 350 00) in word 300 301 (input type UINT8).

Diagnostic Byte No.									**Byte 1**							
Bit no. in diagnostic byte									8	7	6	5	4	3	2	1
Bit no. in word 300 301	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Diagnostics

8

Overview

Introduction

This chapter contains information about diagnostics and trouble shooting.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Evaluation of the PROFIBUS DP Diagnostic Message	62
Ident Codes for Momentum I/O Bases	68
Trouble Shooting via PROFIBUS DP Diagnostic Messages	70

Evaluation of the PROFIBUS DP Diagnostic Message

Overview

During the addressing of the PROFIBUS devices, the diagnostic data addresses are given as well as the input and output data addresses.
Input references are assigned to the diagnostic data. These do not have to have any connection to the Momentum module's input data but can be assigned to any input area in the PLC's state memory.

If new diagnostic data is issued, a bit is set by the slave (e.g. by a Momentum I/O module). If the master detects this bit, it automatically requests the diagnostics.

Structure of the Diagnostic Message

The diagnostic data includes 19 bytes per Momentum module:

- 6 bytes of standard diagnostic data and
- 13 bytes of enhanced diagnostics

The standard diagnostics are identical for all DP slaves, the length and content of the enhanced diagnostics is manufacturer-specific.
Structure of the diagnostic message

Byte No.	Diagnostics Type	Contents
1	Standard diagnostics	Station status 1
2		Station status 2
3		Station status 3
4		Master address
5		Ident no. of the 170 DNT 110 00 (high byte)
6		Ident no. of the 170 DNT 110 00 (low byte)
7	Enhanced diagnostics (specifically for Momentum)	Diagnostics header for I/O bases
8		I/O error
9		Parameter control (prm_control)
10		Firmware version and index of the 170 DNT 110 00
11		
12		
13		
14		
15		
16		reserved
17		reserved
18		Ident code of the I/O base (high byte)
19		Ident code of the I/O base (low byte)

Note: If you want to save memory, please note that bytes 10 .. 19 **do not** have to be stored in the PLC's state memory.

Station Byte 1 (Diagnostic Byte 1)

Diagnostic byte 1

7	6	5	4	3	2	1	0

Bit	Function	Meaning, if Bit = 1
0	Station Non Existent	Master cannot establish communication with slave
1	Station Not Ready	Slave cannot establish communication with master
2	Config Fault	Error in configuration data for slave
3	Extended Diagnosis	Slave provides extended diagnostics as well as standard diagnostics
4	Not supported	A function has been called that the slave does not support
5	Invalid Slave Response	Master received an implausible response from slave
6	PRM Fault	Set by the slave in the case of incorrect bus parameters
7	Master Lock	The slave was parameterized by another master from the one that provided the diagnostic data

Station Byte 2 (Diagnostic Byte 2)

Diagnostic byte 2

7	6	5	4	3	2	1	0

Bit	Function	Meaning, if Bit = 1
0	PRM Request	Slave requires new bus parameters
1	Static Diagnostics	Slave reports that it has received invalid I/O data/parameters
2	Const. 1	Slave reports that it is ready for operation
3	Watchdog On	Watchdog is active
4	Freeze Mode	Slave received the "freeze" command
5	Sync Mode	Slave received the "Sync" command
6	Not used	
7	Deactivated	Master reports that the slave is inactive

Station Byte 3 (Diagnostic Byte 3)

Diagnostic byte 3

7	6	5	4	3	2	1	0

Bit	Function	Meaning, if Bit = 1
0... 6	Not used	
7	Extended Diagnosis Overflow	Set by the master when the diagnostic buffer has overrun.

Station Byte 4 (Diagnostic Byte 2)

Diagnostic byte 4

7	6	5	4	3	2	1	0

Bit	Meaning
0... 7	Address of the master that parameterized the slave (e.g. 1). In the case of a connection interruption the value here is 255 (decimal) or FF (hex).

Ident No. of the Slave (Diagnostic Bytes 5 and 6)

Diagnostic bytes 5 and 6

7	6	5	4	3	2	1	0

Byte	Bit No.								Meaning
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
5	0	1	1	1	0	1	0	1	The value here must be 75 hexadecimal or 117 decimal (high byte).
6	0	0	0	1	0	0	1	0	The value here must be 12 hexadecimal or 18 decimal (high byte).

Note: If the connection to the master is interrupted, both bytes have the value 0.

Diagnostic Header 7 (Diagnostic Byte 7)

Diagnostic byte 7

7	6	5	4	3	2	1	0

Byte	Bit No.								Meaning
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
7	0	0	0	0	1	1	0	1	The value here must be D hexadecimal or 13 decimal.

I/O Error (Diagnostic Byte 8)

Analog I/O bases can report an I/O error, e.g. if they detect a hardware or firmware error in a self test (timeout).
With discrete I/O bases, an I/O error is reported if, for example, there is a short circuit or overload, and with 170 ADM 390 10 if there is an open circuit.
This byte should always contain the value 0.
Diagnostic byte 8

7	6	5	4	3	2	1	0

Byte	**Bit No.**								**Meaning**
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
8	0	0	0	0	0	0	0	0	There have been **no** I/O errors.
	1	1	1	1	1	1	1	1	There has been **one** I/O error.

Parameter Control (Diagnostic Byte 9)

This byte is meaningless for discrete I/O bases. In the case of complex I/O bases, it displays whether new parameters have been sent to and accepted by the I/O base.
Diagnostic byte 9

7	6	5	4	3	2	1	0

Bit	**Function**	**Meaning, if Bit = 1**
0	Not Ready	I/O base is not ready for operation (not yet parameterized)
1	Parameter invalid	I/O base received invalid parameters
2 ... 7	Not used	

Firmware Identification (Diagnostic Bytes 10 ... 15)

Diagnostic bytes 10 ... 15

7	6	5	4	3	2	1	0

Byte	Bit No.								Meaning
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
10	0	0	1	0	0	0	0	0	The value here must be 32 decimal or 20 hexadecimal (ASCII code for a blank).
11	0	1	1	1	0	0	0	0	The value here must be 112 decimal or 70 hexadecimal (firmware identification).
12	1	0	0	0	0	1	0	1	The value here must be 133 decimal or 85 hexadecimal (firmware identification).
13	0	1	0	1	0	0	0	1	The value here must be 81 decimal or 51 hexadecimal (firmware identification).
14	0	0	0	0	0	0	1	0	The value here must be 2 (firmware index).
15	0	0	0	0	0	0	0	0	The value here must be 0 (firmware sub-index, only in test versions > 0).

Ident Code of the I/O Base (Diagnostic Bytes 18 and 19

Diagnostic bytes 18 and 19

7	6	5	4	3	2	1	0

Byte	Meaning
18	The ident code high byte for the I/O base appears here, e.g. E0 hex. This byte is required for unique identification on the PROFIBUS.
19	The ident code low byte for the I/O base appears here, e.g. 2. This byte is required for internal data administration.

An overview of the ident codes can be found in the *Ident Codes for Momentum I/O Bases, p. 68* section.

Ident Codes for Momentum I/O Bases

General Information about Ident Codes

All Momentum I/O modules have an internal ident code. It is required so that a DP master can identify the types of connected devices. The master compares byte 1 of the ident code of the connected DP devices with the ident codes in the configuration data provided by the service terminal. Application data transmission begins only when the proper device types with the correct device addresses are connected to the bus. In this way, a relatively high security from configuration errors is achieved. The ident code is visible to you only if it has been entered in the appropriate files (for Momentum modules, file ASA_7512.GSD on diskette 381 SWA 000 00). The user should always use the current GSD file.
From the ident code you can tell which module type has sent a diagnostics message.

Ident Codes for analog I/O Bases

Ident codes for analog I/O bases can be found here:

Description	Function	Ident code byte 18	Ident code byte 19
170 AAI 030 00	8 input channels	C0 hex	02 hex
170 AAI 140 00	16 input channels	C1 hex	04 hex
170 AAI 520 40	4 input channels, RTD, thermoelements	C2 hex	04 hex
170 AAO 120 00	4 output channels	C3 hex	01 hex
170 AAO 921 00	4 output channels	C4 hex	01 hex
170 AMM 090 00	4 inputs, 2 outputs (discrete) 4 input channels, 2 output channels (analog)	E0 hex	02 hex
170 ANR 120 90	8 inputs, 8 outputs (discrete) 6 input channels, 4 output channels (analog)	17 hex	E3 hex

Ident codes for special modules

Ident codes for special modules can be found here:

Description	Function	Ident code byte 18	Ident code byte 19
170 ADM 540 80	6 inputs, 3 outputs, 120 VAC; 1 Modbus interface	E2 hex	11 hex
170 AEC 920 00	Counter	A0 hex	04 hex

Ident Codes for discrete I/O Bases, 24 VDC

Ident codes for discrete I/O bases can be found here:

Description	Function	Ident code byte 18	Ident code byte 19
170 ADI 340 00	16 inputs	02 hex	00 hex
170 ADI 350 00	32 inputs	01 hex	00 hex
170 ADO 340 00	16 outputs	06 hex	00 hex
170 ADO 350 00	32 outputs	09 hex	00 hex
170 ADM 350 10	16 inputs, 16 outputs	08 hex	00 hex
170 ADM 350 11	16 inputs, 16 outputs	08 hex	00 hex
170 ADM 370 10	16 inputs, 8 outputs	0B hex	00 hex
170 ADM 390 10	16 inputs, 12 outputs	0C hex	00 hex
170 ADM 390 30	10 inputs, 8 outputs	0A hex	00 hex

Ident Codes for discrete I/O Bases, 120/230 VAC

Ident codes for discrete I/O bases can be found here:

Description	Function	Ident code byte 18	Ident code byte 19
170 ADI 540 50	16 inputs / 120 VAC	03 hex	00 hex
170 ADI 740 50	16 inputs / 240 VAC	28 hex	00 hex
170 ADO 530 50	8 outputs / 120 VAC	16 hex	00 hex
170 ADO 540 50	16 outputs / 120 VAC	14 hex	00 hex
170 ADO 730 50	8 outputs / 230 VAC	17 hex	00 hex
170 ADO 740 50	16 outputs / 230 VAC	15 hex	00 hex
170 ADM 690 50	10 inputs, 8 outputs, 120 VAC	0A hex	00 hex
170 ADM 690 51	10 inputs, 8 outputs, 120 VAC	09 hex	00 hex
170 ARM 370 30	10 inputs (24 V), 8 relay outputs 120 VAC	18 hex	00 hex

Trouble Shooting via PROFIBUS DP Diagnostic Messages

Trouble Shooting General Information

In addition to the evaluation of the diagnostic message, there are the following important error possibilities:

- Comparison of the configured module type
- Examination of the voltage supplies to the modules
- Comparison of the configured addresses with the specified addresses on the bus adapter
- Examination of the parameterization in the case of complex (analog) modules
- Taking into consideration EMC measures and potential equalization
- Examining cabling (bus connector screws, correct cable assignment, terminal resistors, appropriate connectors etc.)
- General contact problems with connections

Overview of diagnostic Examples

The diagnostic data of a 170 AMM 090 00 in the following cases can be found in the table:

Case No.	Meaning
1	Output state The I/O base is supplied with voltage, the Profibus is correctly configured and running. The "BF" LED on the communications adapter of the AMM 090 is off. The I/O base has not, however, been parametrized.
2	Error in parameterization. The I/O base was mistakenly parameterized as 170 AAO 921 during the bus configuration. The PROFIBUS is running but the "BF" LED on the communications adapter of the AMM is lit.
3	Slave is not reporting (master diagnostics): One slave was properly configured. However, it cannot be found because the bus connector was disconnected or the voltage supply was interrupted.
4	Valid parameters: One set of valid parameters has been transferred to the AMM 090
5	Invalid parameters: One set of invalid parameters has been transferred to the AMM 090

Normal state of the diagnostic data at program start

The normal state of the diagnostic data at program start is displayed in this table.
Position of the bits in the respective diagnostic byte:

7	6	5	4	3	2	1	0

Diagnostic Byte		Format	Contents		
No.	**Meaning**		**Case 1**	**Case 2**	**Case 3**
1	Station status 1	Bin	00001000	00000110	00000001
2	Station status 2	Bin	00001100	00000101	00000000
3	Station status 3	Bin	00000000	00000000	00000000
4	Master address	Dec	1	255	255
5	Ident no. of the 170 DNT 110 00 (high byte)	Hex	75	75	0
6	Ident no. of the 170 DNT 110 00 (low byte)	Hex	12	12	0
7	Diagnostics header for I/O bases	Hex	D	D	D
8	I/O error	Bin	00000000	00000000	00000000
9	Parameter control	Bin	00000001	00000000	00000001
10	Firmware version and index of the 170 DNT 110 00	Hex	20	20	20
11		Hex	70	70	70
12		Hex	85	85	85
13		Hex	51	51	51
14		Hex	2	2	2
15		Hex	0	0	0
16	reserved	Hex	0	0	0
17	reserved	Hex	0	0	0
18	Ident code of the I/O base (high byte)	Hex	E0	E0	E0
19	Ident code of the I/O base (low byte)	Hex	2	2	2

Status Changes, starting from Normal State

The changes from output status (case 1) to states 3, 4 and 5 are displayed in the table. The changes in comparison with the output status are marked in bold.
Position of the bits in the respective diagnostic byte:

7	6	5	4	3	2	1	0

Diagnostic Byte		Format	Case 1 (Output state)	Case 3 (No slaves reporting)	Case 4 (Valid parameters)	Case 5 (Invalid parameters)
No.	**Meaning**					
1	Station status 1	Bin	00001000	**00000001**	**00000000**	00001000
2	Station status 2	Bin	00001100	**00000000**	00001100	00001100
3	Station status 3	Bin	00000000	00000000	00000000	00000000
4	Master address	Dec	1	**255**	1	1
5	Ident no. of the 170 DNT 110 00 (high byte)	Hex	75	**0**	75	75
6	Ident no. of the 170 DNT 110 00 (low byte)	Hex	12	**0**	12	12
7	Diagnostics header for I/O bases	Hex	D	D	D	D
8	I/O error	Bin	00000000	00000000	00000000	00000000
9	Parameter control	Bin	00000001	00000001	**00000000**	**00000011**
10	Firmware version and index of the 170 DNT 110 00	Hex	20	20	20	20
11		Hex	70	70	70	70
12		Hex	85	85	85	85
13		Hex	51	51	51	51
14		Hex	2	2	2	2
15		Hex	0	0	0	0
16	reserved	Hex	0	0	0	0
17	reserved	Hex	0	0	0	0
18	Ident code of the I/O base (high byte)	Hex	E0	E0	E0	E0
19	Ident code of the I/O base (low byte)	Hex	2	2	2	2

Note: With a change in status from case 4 to case 5, byte 9 has the value 0000 0010 and the I/O base continues to operate with the old parameters.

With a change in status from case 4 to case 3, byte 9 has the value 0000 0000.

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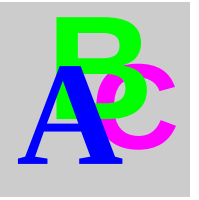

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